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Black Willow



Forest Service

U. S. DEPARTMENT OF AGRICULTURE

BLACK WILLOW

(*Salix nigra*)

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There are some 200 species of willow of which probably one-half grow in the United States and Canada. The willows range in size from small plants a few inches high to trees 4 feet in diameter and 140 feet high. All of them grow near water, generally along the banks of streams or lake shores. Those which grow to tree size are used in limited quantities for lumber,¹ most of which is made into boxes and containers of various kinds and furniture parts. Willow wood is light in weight, soft, and weak. It has excellent gluing properties and is resistant to splitting and splintering.

Of the willow species native to the United States only about half a dozen reach tree size and only one—the black willow of the eastern and central United States—grows to a size suitable for sawlogs in sufficient quantity to supply lumber to the market under its own name. Practically all black willow of sawlog size is found in the lower Mississippi Valley. Other native willows which grow to tree size in parts of their range and occasionally reach sawlog size are the peachleaf willow (*Salix amygdaloides*) and the sandbar willow (*S. interior*), both of which are found throughout a large part of the United States and in parts of Canada, and the three western species—Pacific willow (*S. lasiandra*), red willow (*S. laevigata*), and arroyo willow (*S. lasiolepis*).

Among the willows imported from Europe and extensively planted in the United States are the three tree willows—white willow (*Salix alba*), crack willow (*S. fragilis*), and weeping willow (*S. babylonica*)—and the three basket willows—American green willow (*S. amygdalina*), Lemley willow (*S. pentandra*), and purple willow (*S. purpurea*).

Nomenclature.—Black willow is sometimes called swamp willow and often simply willow.

Distribution and growth.—Black willow grows along the borders of streams and low-lying lake shores throughout the eastern United States except in Florida, most of South Carolina and Georgia, and the southern part of Alabama (fig. 1). It is found throughout nearly all of Texas, Oklahoma, Kansas, Nebraska, the southeastern part of South Dakota, and the eastern part of North Dakota. It is also found in Canada in the extreme southern portions of Ontario, Quebec, and New Brunswick. Black willow attains tree size over the greater part of its range, but grows best in the deep, rich, moist, alluvial bottom lands of the lower Mississippi River. It is prevalent along practically the whole course of the Mississippi, increasing in abundance and size along the lower reaches.

¹ The amount of lumber produced from willow in recent years has been roughly one-half that from black walnut and one-fifth that produced from basswood.

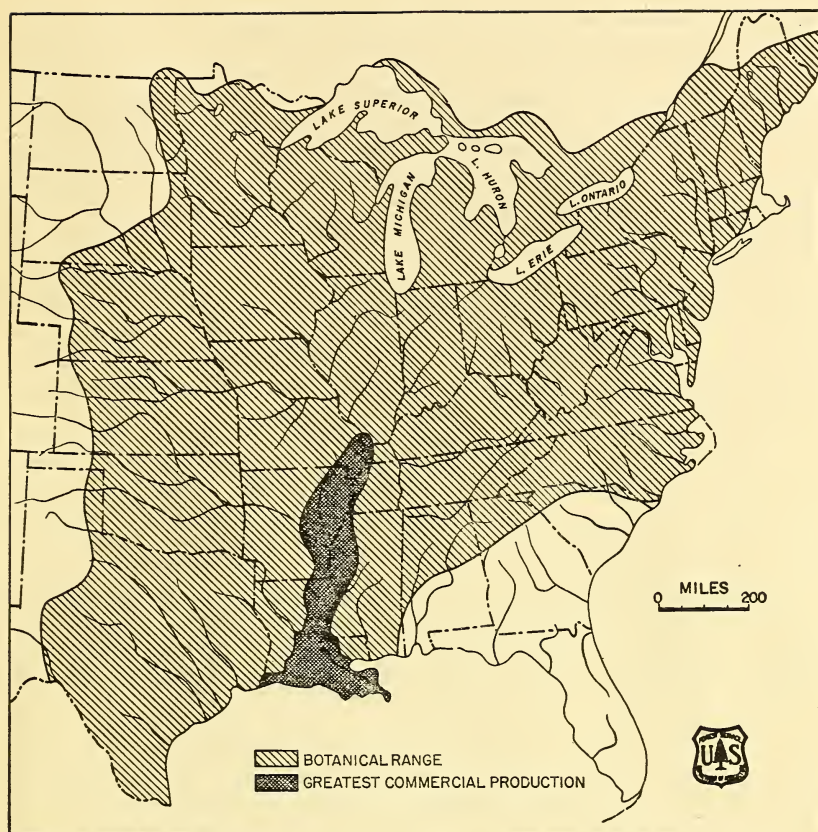


FIGURE 1.—Range of black willow (*Salix nigra*) in the United States.

Under favorable conditions of soil, moisture, and climate black willow grows very rapidly in height provided it has plenty of sunlight. All willows are intolerant of shade. Rapid height growth is especially marked in the dominant trees in dense stands where there is intense competition for light. Measurements to obtain the average height of trees of various ages in the Mississippi Valley region showed the following: Age 5 years, 32 feet; 10 years, 50 feet; 20 years, 73 feet; 40 years, 101 feet; 60 years, 116 feet.² The diameter growth is also rapid, especially for the first 10 years, after which it falls off gradually. Measurements made to obtain the average diameter of trees of various ages in Arkansas showed the following: Age 5 years, 2.6 inches; 10 years, 5.6 inches; 20 years, 7.5 inches; 40 years, 19.4 inches; 60 years, 25.7 inches.²

The black willow of the North and that grown on poor soil in the South is generally from 30 to 60 feet high and 6 to 18 inches in diameter, and seldom furnishes a satisfactory sawlog. Forest trees grown under favorable conditions in the South commonly produce

² See LAMB, G. N. WILLOWS: THEIR GROWTH, USE, AND IMPORTANCE. U. S. Dept. Agr. Bul. 316, 52 pp., illus. 1915.

trunks clear of branches for 40 feet. The average diameter of mature trees in Mississippi and Louisiana is about 24 inches. Black willow is short-lived—the greatest age recorded for a sound tree is 70 years.

The willows are subject in greater or less degree to damage from insects, fungi, wind, fire, and grazing. Several kinds of insects attack the foliage or bore into the bark or wood, but the resultant injury is serious only in seasons especially favorable for insect growth. The damage caused by decay-producing fungi attacking the wood in the tree or the foliage is probably not greater than that occasioned by insects.

The heartwood of willow is particularly susceptible to attack by the common decay-producing fungi when they can gain access through wind breakage, fire damage, or holes made by insects.³ This heart rot may occur at the base of the tree or farther above the ground, but may extend only a short distance along the trunk, the wood being sound both above and below the infected portion.

Exposed plantations which have reached tree size often suffer severe breakage from wind, which is probably the greatest enemy of willow trees because of the brittleness of the green wood. The green shoots of young willows are eaten with avidity by cattle, hogs, etc., and protection of young plantations from grazing is necessary where numbers of livestock are at large.

Supply.—A large proportion of willow saw timber (probably 90 percent) is in the Mississippi Delta region. The stand of willow of saw-timber size (practically all black willow) in the Mississippi Delta—including parts of southern and eastern Louisiana, part of western Mississippi, part of eastern Arkansas, the southeastern corner of Missouri, and the western edge of Tennessee—amounted to 1,503,600,000 board feet⁴ in 1937, according to the findings of a forest survey in the Southeastern States.⁵ The stand in Louisiana was 589,400,000 board feet, Mississippi, 610,000,000 board feet, and Arkansas,⁶ 304,200,000 board feet. Of the total amount of willow saw timber in the Mississippi Delta, about 800,000,000 board feet occurs in areas that support at least 1,000 board feet per acre of all species, including willow, and about 700,000,000 board feet in areas which support a mixed stand of less than 1,000 board feet per acre. By far the greater part of the better grade of willow timber is located in the areas with mixed stands of over 1,000 board feet per acre. Estimates of the stand of willow other than in the Mississippi Delta are not available. The total stand of willow of all species of saw-timber size approximates 1,700,000,000 board feet.

Production of lumber.—Willow lumber was first listed separately in the 1909 production statistics of the Bureau of the Census. In that year production was 1,242,000 board feet (fig. 2). Since then it has risen irregularly. The maximum (29,600,000 board feet) occurred in 1941. For the 10-year period 1933–42 the average annual production was approximately 18,000,000 board feet. For the same period the average annual cut of basswood lumber, with which willow competes for some uses, was nearly five times as large. Mississippi

³ See HUBBARD, W. F. THE BASKET WILLOW. U. S. Forest Serv. Bul. 46, 100 pp., illus. 1904.

⁴ Based on the International $\frac{1}{4}$ -inch rule.

⁵ Survey conducted by the Southern Forest Experiment Station of the Forest Service as part of a Forest Survey of the United States.

⁶ Including the southeastern corner of Missouri and the western edge of Tennessee.

and Louisiana have been the two leading States in producing willow lumber, with smaller amounts furnished principally by Arkansas, Tennessee, and Missouri.

Cooperage.—The amount of willow used for slack cooperage, as indicated by scattered and incomplete records,⁷ is small. In 1907, 1908, and 1909 both slack staves and heading were reported in average yearly amounts of 3,260,000 staves and 160,000 sets of heading. The only other available figure of production is 832,000 sets of heading reported in 1927. In other years for which cooperage statistics are available willow is either not mentioned or is included in the "all other" column. If it is assumed that the average annual production in recent years has been 2,000,000 staves and 250,000 sets of heading, this would be equivalent to about 1,000,000 board feet.⁸

Veneer.—Records of the amount of willow used for veneer, like those for cooperage, are scattered and incomplete. Figures are available for only 4 years (1909, 1921, 1923, and 1925) and a very rough estimate for recent years would be 1,000,000 board feet annually.

Small but indeterminate amounts of willow wood are also used for excelsior, fence posts, and fuel, and in the manufacture of charcoal and paper pulp. The total average annual cut of willow in the last few years⁹ for all purposes is estimated very roughly at the equivalent of 30,000,000 board feet.

Properties.—The heartwood of black willow when thoroughly seasoned is grayish-brown or light reddish-brown and frequently contains darker streaks along the grain. When freshly sawed from the log the heartwood varies from dark reddish-brown to blue or almost black. The sapwood is whitish to creamy yellow. The annual rings are relatively indistinct.

The wood of black willow is quite uniform in texture, with a somewhat interlocked grain which makes it resistant to splitting. It is classed among the most difficult woods to machine satisfactorily with power tools in shaping, turning, and mortising operations.¹⁰ The wood is light in weight,¹¹ exceedingly weak when used as a beam or post, moderately soft, and moderately high in shock resistance. It has a moderately large shrinkage and requires care in seasoning to avoid warping and checking but stays in place well when once properly seasoned. The wood glues easily with different glues under a wide range of conditions. It can be dented and bruised without splintering. Like most woods that are light in weight, it has low nail-holding ability but does not split easily under the action of nails.

Black willow is not a durable wood when used under conditions favorable to decay. In decay resistance it is classed with cottonwood and basswood. The heartwood is moderately difficult to treat with a preservative. Pacific willow, the only other willow on which the results of strength tests are available, is slightly heavier than black willow and somewhat above it in practically all of its strength properties.

⁷ Bureau of the Census.

⁸ The following converting factors were used: 3 slack staves=1 board foot; 1 set of slack heading=2 board feet.

⁹ 1936-42.

¹⁰ See DAVIS, E. M. MACHINING AND RELATED CHARACTERISTICS OF SOUTHERN HARDWOODS. U. S. Dept. Agr. Tech. Bul. 824, 42 pp., illus. 1942.

¹¹ The average weight of black willow in an air-dry condition (12 percent moisture) is 26 pounds per cubic foot.

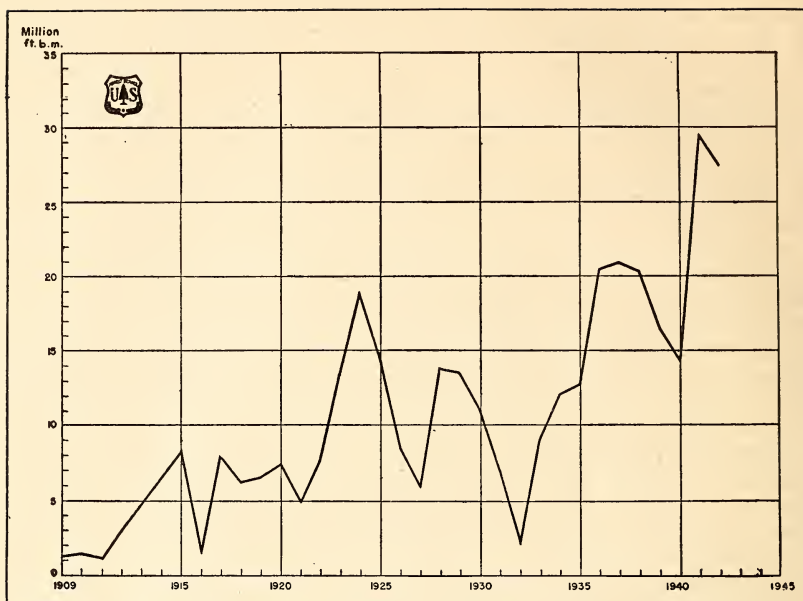


FIGURE 2.—Lumber production of black willow (*Salix nigra*), 1909-42.

Willow wood subjected to destructive distillation produces an exceptionally high-grade charcoal especially suitable for black powder manufacture.¹² When used as a fuel, willow makes a quick, hot fire. The wood can be reduced readily to paper pulp by the soda and sulfite processes. The fibers are short, however, and willow pulp is generally used as a filler in mixture with pulps made from the longer fibered woods.

Willow bark is an important source of tanning in Europe where the crack willow and a basket willow (*Salix viminalis*), which contain 12 to 14 percent of tannin in their bark, are considered the most satisfactory for tannin production. Tests made some years ago on bark from black willow and crack willow grown in this country showed a tannin content between 6 and 9 percent, which is less than that of the native barks ordinarily used as sources of tannin.

Principal uses.—The willows which grow to tree size are used principally for lumber, and in much smaller amounts for slack cooperage, veneer, excelsior, charcoal, paper pulp, artificial limbs, fuel, and fence posts. The shoots produced by basket willows are used in weaving baskets and furniture. Willow plantations are widely used to protect the banks of streams from erosion and as binder for shifting sand. River banks are frequently protected by "mattresses" made from small willow trees 1 to 5 inches in diameter, so bound together as to form long mats about 1 foot thick and often 1,000 feet long

¹² The conversion of wood to charcoal by destructive distillation is generally accomplished by placing cordwood in steel ovens which are then tightly closed and heated by fires underneath. The vapors distilled from the wood pass off through outlets at the top of the ovens and are led to condensers. At the completion of the process the wood in the ovens has become converted to charcoal.

and 250 feet wide. These mats are sunk into the mud and sand at the shore line by weighting them with rock. The flowers produced by willow trees have long been recognized as a useful source of honey, and many beekeepers have planted willows for this purpose.

The greater part of the black willow lumber produced is remanufactured and goes principally into containers of various kinds (shipping boxes, baskets, fruit packages, cigar and tobacco boxes), furniture (including kitchen cabinets), and caskets and burial boxes. Smaller amounts of the remanufactured lumber are used for sewing machines and artificial limbs. In recent years a growing proportion of black willow lumber is being used locally in medium and low grade building construction in such forms as roof sheathing, wall sheathing, subflooring, and studding. The clear heartwood of black willow, especially material with variations in color, has found some use as interior finish in a field where sweetgum has been a dominant wood.

Black willow in the form of veneer is frequently used as a core in plywood in which the faces may be of harder woods.

Willow has long been used for artificial limbs. Its light weight, uniform texture, excellent gluing properties, ability to dent and bruise without splintering, and ability to hold its shape once it has been properly seasoned, have made it the preferred wood for this purpose. Another special use for willow is polo balls, where ability to withstand blows without splintering combined with light weight is the controlling property. Willow is also preferred for cutting boards because of its light weight and proper combination of uniform texture and softness.

Table 1 shows the volumes of willow used in the manufacture of wooden products in 1912, 1928, 1933, and 1940. It includes willow largely in the form of lumber, with comparatively small amounts of logs and bolts, and veneer.

TABLE 1.—*Black willow used in the manufacture of wooden products*

[Thousands of board feet]

Classes of products	1912	1928	1933	1940
Boxes, baskets, and crating	10, 005	5, 098	4, 233	10, 532
Boxes, cigar and tobacco			132	
Car construction and repair				4
Caskets and burial boxes		20	127	3, 447
Dairy, poultry, etc., supplies			158	
Fixtures	150	410	96	66
Furniture	40	934	656	4, 004
Handles	19			
Instruments, scientific				2
Sash, doors, general millwork	266	133	1	40
Sewing machines		10		849
Ship and boat building	1			
Surgical supplies	56	515		239
Vehicles, motor		25	174	13
Vehicles, nonmotor		4		
Woodenware and novelties	128	21	109	
Total	10, 665	7, 170	5, 686	19, 196

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